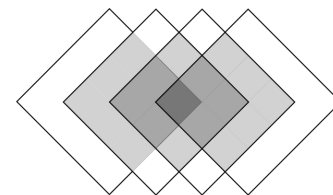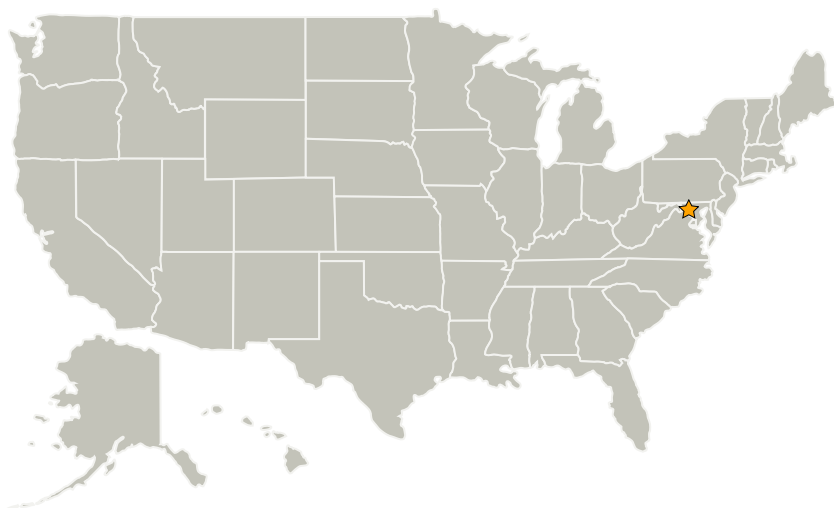## Project Introduction

We propose to use deep learning techniques to enhance the spatial resolution of time series satellite images. This improvement, also called "super-resolution" is becoming essential to compensate for relatively low resolution sensors on resource constrained environments such as SmallSats and CubeSats. Software approaches are increasingly considered in connection with smaller satellites for which size and power constraints limit the capabilities of the sensors. Recently, deep learning techniques have been used successfully for achieving super-resolution of single hyperspectral images; we are generalizing this approach to time series satellite multispectral or hyperspectral images.

Anticipated Benefits

Higher resolution satellite imaging data is often desirable or required for the understanding of the science or process being observed. There are however resource constraints that may limit the sensor capability such as size, cost, power, or limited transmission bandwidth. The trade-offs are not likely to change for future missions as the spatial resolution needs will continue to increase as fast as new sensor technology. The field of machine learning, and in particular deep learning, has the potential to mitigate trade-offs and drive significant advances in the processing of all types of science data.

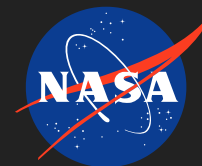## Primary U.S. Work Locations and Key Partners

Resolve Super-Resolution pixels from low resolution pixels.

Table of Contents

Organizations Performing Work	Role	Type	Location
⭐Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Bowie State University(BSU)	Supporting Organization	Academia Historically Black Colleges and Universities (HBCU)	Bowie, Maryland
University of Maryland-College Park(UMCP)	Supporting Organization	Academia Asian American Native American Pacific Islander (AANAPISI)	College Park, Maryland

Images
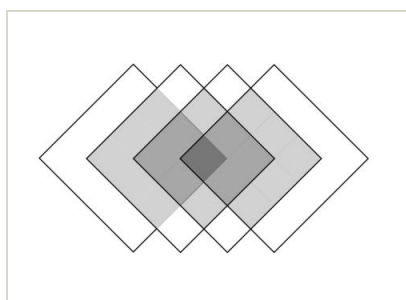
Super-Resolution of Time Series Satellite Images
Resolve Super-Resolution pixels from low resolution pixels.
(https://techport.nasa.gov/image/28252)

Organizational Responsibility

Responsible Mission Directorate:
Mission Support Directorate (MSD)

Lead Center / Facility:
Goddard Space Flight Center (GSFC)

Responsible Program:
Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:
Peter M Hughes

Project Managers:
Jacqueline J Le Moigne-stewart
Michael A Johnson

Principal Investigator:
Troy J Ames
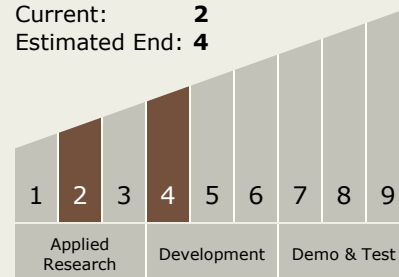
Co-Investigators:
Wojciech Czaja
Manohar Mareboyana

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **4**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  └ TX11.4 Information Processing
    └ TX11.4.2 Intelligent Data Understanding

Target Destinations
The Sun, Earth, Foundational Knowledge

Supported Mission Type
Projected Mission (Pull)